UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2466

Ref: 8HWM-FF

OCT -5 1992

Mr. Frazer Lockhart
Department of Energy
Rocky Flats Office
P.O. Box 928
Golden, Colorado 80402-0928

RE: Technical Memorandum No. 8, Contaminant Identification, Operable Unit 1

Dear Mr. Lockhart:

The above referenced document has been reviewed by the U.S. Environmental Protection Agency (EPA), and its contractor, PRC Environmental. The comments generated through this review are enclosed. EPA cannot approve this document due to the fact that it did not consider all analytes that pertain to direct exposure to ground water, and in addition, analytical data from subsurface soils were not evaluated. In order to present a complete and well documented baseline risk assessment, these evaluations are necessary.

If you have any questions regarding these matters, please contact Gary Kleeman at 294-1071.

Sincerely,

Martin Hestmark, Manager
Rocky Flats Project

Enclosure

cc: Gary Baughman, CDH
Joe Schieffelin, CDH
Bruce Thatcher, DOE
Scott Grace, DOE
Dennis Smith, EG&G

1.0 GENERAL COMMENTS

The purpose of the Technical Memorandum No. 8 is to describe the selection process which will be used in the baseline risk assessment (BRA) to identify contaminants of concern (COCs) for contaminated media in operable unit (OU) 1. This is a critical phase of the remedial investigation because the selected COCs are used exclusively to quantify human health risks in the BRA. Contaminants eliminated during this stage of the analysis will be disregarded for further consideration in the BRA. For this reason, a thorough review of contaminant concentrations, locations, and statistical analysis is warranted.

The veracity of the document could not be confirmed due to the lack of data and descriptive methodology. Summary tables of chemical concentrations and statistical analysis are well presented, but are insufficient to ascertain whether the selected COCs definitively represent the entire inventory of hazardous chemicals for OU 1.

The decision to limit evaluation of ground water analytes to volatiles and semi-volatiles does not present a complete analysis for the baseline risk assessment. Due to the fact that the potential for direct exposure to ground water (ingestion and dermal) has not been completely eliminated, it is necessary to consider all analytes that could be associated with this pathway in the process of identifying contaminants. This would be best accomplished by developing a separate list of contaminants specific to direct ground water exposure. By compiling two separate lists for the different ground water exposure scenarios, any differences in identified contaminants will be readily apparent and more easily managed.

For completeness, it is necessary to evaluate analytical data collected from subsurface soils in addition to the surface soil data that was evaluated in this technical memorandum. This need not take the form of two separate lists as specified above for ground water contaminants. EPA's concern is that all contaminants detected in subsurface soils must be considered in this process and that this must be demonstrated in the BRA.

Also of great concern is the methodology used for eliminating chemicals which represent $< 1\%$ of the total risk. The process of simply multiplying the water or soil concentration by the slope factor or reference dose is not appropriate and misleading. Since slope factors and reference doses are based on the probability of an effect given a specified intake rate and exposure time, the comparison should be made on the same basis. In other words, a chronic daily intake should be calculated for each chemical using its concentration in soil or water and the default exposure equations provided in RAGS, Part A. For a carcinogen, the chronic daily intake should be multiplied by the slope factor to determine the risk. If that risk is less than say 10E-08, the chemical can be excluded as a COC. For a non-carcinogen, the chronic daily intake is divided by the reference dose. If the resulting Hazard Quotient is less than 0.01, the chemical can be excluded as a COC.

With the procedures outlined on pages 2-18 through 2-23, a number of chemicals which could pose an adverse risk are eliminated. For example, on page 2-19, both chloroform and methylene chloride are calculated to contribute $<1\%$ of total risk and, according to the text on page 2-18, are eliminated as COCs. Both of these chemicals are carcinogenic and have slope factors in EPA's IRIS Database. However, these slope factors were not included in the table. Based on these slope factors, acceptable health based concentrations in drinking water for chloroform and methylene chloride are 2.2 ug/l and 8.4 ug/l respectively, whereas the maximum concentrations for these compounds listed on page 2-19 are actually 170 ug/l and 620 ug/l. These two chemicals are added back into the COC list at the end of the tech memo because of other factors, but the fact that they were even eliminated emphasizes the major flaws in this screening procedure. Other chemicals which were eliminated by this screen, but should have been kept in include toluene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, and arochlor 1254. Again, some of these chemicals were added back in for various arbitrary reasons at the end, but the point is, they should never have been eliminated.

The first step of the screening procedure on page 2-4 recommends that all essential elements be eliminated from further consideration as contaminants of concern. Page 2-5, paragraph 3, states that this is according to the direction of EPA Region 8. This is incorrect. At the meeting referenced at the bottom of page 2-5, EPA cautioned against using this criteria since it would also exclude selenium, chromium, zinc, and perhaps arsenic. This criteria should be modified to reflect the **entire** scope of the guidance in RAGS, Part A, page 5-23, "Chemicals that are (1) essential human nutrients, (2) present at low concentrations (i.e., only slightly elevated above naturally occurring levels), and (3) toxic only at very high doses (i.e., much higher than those that could be associated with contact at the site) need not be considered further in the quantitative risk assessment."

2.0 SPECIFIC COMMENTS

1. Page 2-2, Fourth Paragraph. Sample dilutions and matrix effects responsible for variations between sample quantitation limits (SQLs), are a necessary component of chemical analyses of environmental contaminants. The results from high SQLs are as valid as those from lower SQLs or "the most commonly observed detection limit." However, bias is introduced into the selection of COCs when high SQLs are arbitrarily eliminated from the data set. Because there is an equal probability that the contaminant may not be present in the sample or may be present at a level just below the SQL, Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part A (RAGS) (EPA, 1989a) presents a compromise. One-half of the SQL should serve as the proxy value for computing the mean, standard deviation, and upper 95 percent confidence limit concentrations for nondetected chemicals. The only exception to this rule is when the calculated exposure concentration exceeds the maximum detected concentration for a particular sample set (EPA, 1989a). If high SQLs are eliminated from the analysis, the frequency of detection is greatly affected. Chemicals that could otherwise be eliminated from consideration based on a frequency of detection of 5 percent or less can be unnecessarily retained and carried through the quantitative risk assessment. Retaining these infrequently detected chemicals could ultimately result in the elimination of high-priority hazardous chemicals from the list of COCs during the application of the toxicity-concentration screen. Therefore, to ensure a complete list of COCs, data should be analyzed according to RAGS and not arbitrarily eliminated from the database.

   Rationale: Data should be analyzed according to RAGS (EPA, 1989a), and not arbitrarily eliminated from the data base. Inconsistent elimination of data could result in an inaccurate list of COCs.

2. Page 2-13, Section 2.2.3. The methodology used to screen for hot spots was not adequately described. From the brief discussion presented, however, the spatial distribution of contaminants across OU1 does not appear to have been taken into consideration and the identification of hot spots appears to be based solely on the inspection of tabulated data. In addition, the analysis should be conducted with reference to sample locations.

Rationale: Tabulated data and spatial information on the location of elevated concentrations should both be used to identify hot spots.

3. Page 2-13, Section 2.2.3. Simply comparing elevated concentrations to the central tendency (the mean or median) concentration is insufficient for identifying hot spots, particularly for soil contaminants. A more conventional and rigorous approach uses the difference between the highest and lowest detected concentration. This is because the difference between the central indicator and the highest detected value will be small when the chemical concentrations from all samples are at the same elevated levels. The mathematical basis for this approach is that the two variables are not independent because the mean concentration depends on the individual concentrations. Pooling the elevated concentrations will result in a weighted average biased in the direction of high concentrations. The difference between individual elevated concentrations and the mean, therefore, will be relatively small. No bias is introduced when the maximum and minimum concentrations are compared because the variables are independent.

Also, as mentioned in comment number 2, a correlation between the spatial distribution and elevated contaminant concentrations is a necessary component of any hot spot analysis.

Rationale: The range of contaminant concentrations should be used to screen for hot spots in OU1.

4. Page 2-13, Section 2.2.4. Background data, such as the mean, standard deviation, range, and upper 95 percent confidence limit, are not presented in the document. Lacking this information, it could not be concluded that site-related contaminants are equal to or less than background concentrations. This information is an integral part of the selection of COCs because the elimination of inorganic contaminants is based on this criterion. This information should be tabulated along with site-specific data.

Rationale: Background information used to eliminate chemicals from the list of COCs must be included with site-specific information.

5. Page 2-17, Last Paragraph. Why are published sources of background data being used here for comparison with site data? Any use of published data must be justified and must accurately represent actual site background conditions. Sufficient information must be presented to allow a judgement to be made as to the applicability of published sources to the naturally occuring site-specific conditions.

Rationale: Use of published sources for background data must be justified and shown to represent actual site conditions at Rocky Flats.

6. Page 2-13, Section 2.2.4. The selection of statistical tests to compare background and site-specific chemical information appears to be flawed and should be reevaluated. The fundamental assumption that the data are nonparametric rather than parametric is incorrect since the sample data are continuous and random and not restricted to discreet "fixed" numerical values. As such, it is not appropriate to use nonparametric statistical analysis such as the Mann-Whitney test. A commonly used decision tree for selecting appropriate statistical tests has been included as a reference.

Rationale: The statistical test employed should reflect the probability density function of the data.

7. Page 2-14, Second Paragraph. It is incorrectly stated that Bartlett's Test and the F-test can be used to determine the statistical difference between mean concentrations. The singular utility of these tests is to determine heterogeneity or homogeneity of sample variances. Subsequently, the result of these tests are used only to choose the appropriate statistical test for the null hypothesis, such as Student's t- or Cochran's t-test. A statistical difference between mean concentrations can be determined only after applying the null hypothesis with these tests. Thus, while Bartlett's- and the F-test are important to the overall strategy of statistical tests, they are inappropriate for testing the null hypothesis used to determine differences between mean concentrations.

Rationale: Tests of variance cannot be used to determine statistical differences between means.

8. Page 2-8, Table 2-2a. As presented in the summary statistics in the appendices, the maximum concentration for aluminum in soil is 270,000 parts per billion (ppb). The minimum and maximum values appear to be transposed in Table 2-2a and should be corrected.

Rationale: There appear to be inconsistencies between summary statistics and tabulated data.

9. Page 2-15, Table 2-3. This table is confusing and should be further clarified. It is not clear what "yes" and "no" refer to in columns. Based on the limited description, however, it appears that beryllium and nickel should have been selected as COCs. It is indicated on the table that they are present onsite at concentrations higher than background.

Rationale: The table is confusing in its current form and should be modified.

10. Page 2-19, Table 2-4. The source of toxicity constants appear to be in error for several chemicals. The reference dose for some chemicals, such as trichlorofluoromethane, are either incorrect or has been derived using equations not presented in the table or text. Methods used to derive individual toxicity constants that are different from EPA methodology, and rationale, justifying their use, should be provided. In addition, the risk factor for 1,1-dichloroethane should be 350.

Rationale: Sources of toxicity information should be corrected and derivations that deviate from EPA values presented. Risk factors should be recalculated.

11. Page 2-19, Table 2-4. Bis(2-ethylhexyl)phthalate is a class B2 carcinogen with a carcinogenic slope factor of 1.4E-2 mg/kg-day but is presented as a noncarcinogen in Table 2-4. The toxicity values for 1,1,1-trichloroethane, 1,1-dichloroethane, and cis-1,2-dichloroethene are currently under consideration in EPA's Integrated Risk Information System (IRIS), but reference doses (RfDs), from some unknown source are presented in the table. The methodology used to derive the values for these chemicals should be presented.

Rationale: The classification of chemicals in Table 2-4 should be reexamined and methodology used to derive toxicity constants presented.

12. Page 2-20, Table 2-5. The inhalation slope values for compounds in this table are not listed in IRIS. Trichloroethene and tetrachloroethene are classified in IRIS as having no data to determine the potential carcinogenicity but risk factors are included in this table. The acronym "ND" should also be footnoted since the meaning is unclear.

The slope factors multiplied by the concentrations do not equal the risk factors listed. If a conversion factor is being used, it should be referenced and explained.

The source of the toxicity constant for 1,1,2-trichloroethane is listed as "none." The derivation of this constant should be explained.

Rationale: Sources of information, important assumptions, and conversion factors should be presented in the text.

13. Page 2-22, Table 2-7. The source of the toxicity constants for radiological contaminants should be the Health Effects Summary Tables (HEAST), not IRIS.

Rationale: Sources of information should be referenced correctly.

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14. Page 2-22, Table 2-8. The slope factor for Aroclor-1254 is found in IRIS, not HEAST. Similarly, the carcinogenic slope factor for benzo(a)pyrene is 5.8, not 6.1 mg/kg-day. Although a few EPA regions have applied the Toxicity Equivalency Factor (TEF) approach for PAH's, this is not approved national policy. For this reason, risk estimates with PAH's should include calculations using the standard EPA method of equating all PAH's equivalent to benzo(a)pyrene in toxicity, as well as calculations based on the TEF approach.

The TEF for ideno(1,2,3-c,d)pyrene is 0.1 which, when multiplied by the slope factor of benzo(a)pyrene, results in a slope factor of 0.58.

From: Principles and Methods of Toxicology
Second Edition, Edited by
A. Wallace Hayes.
Raven Press, Ltd. New York, 1989

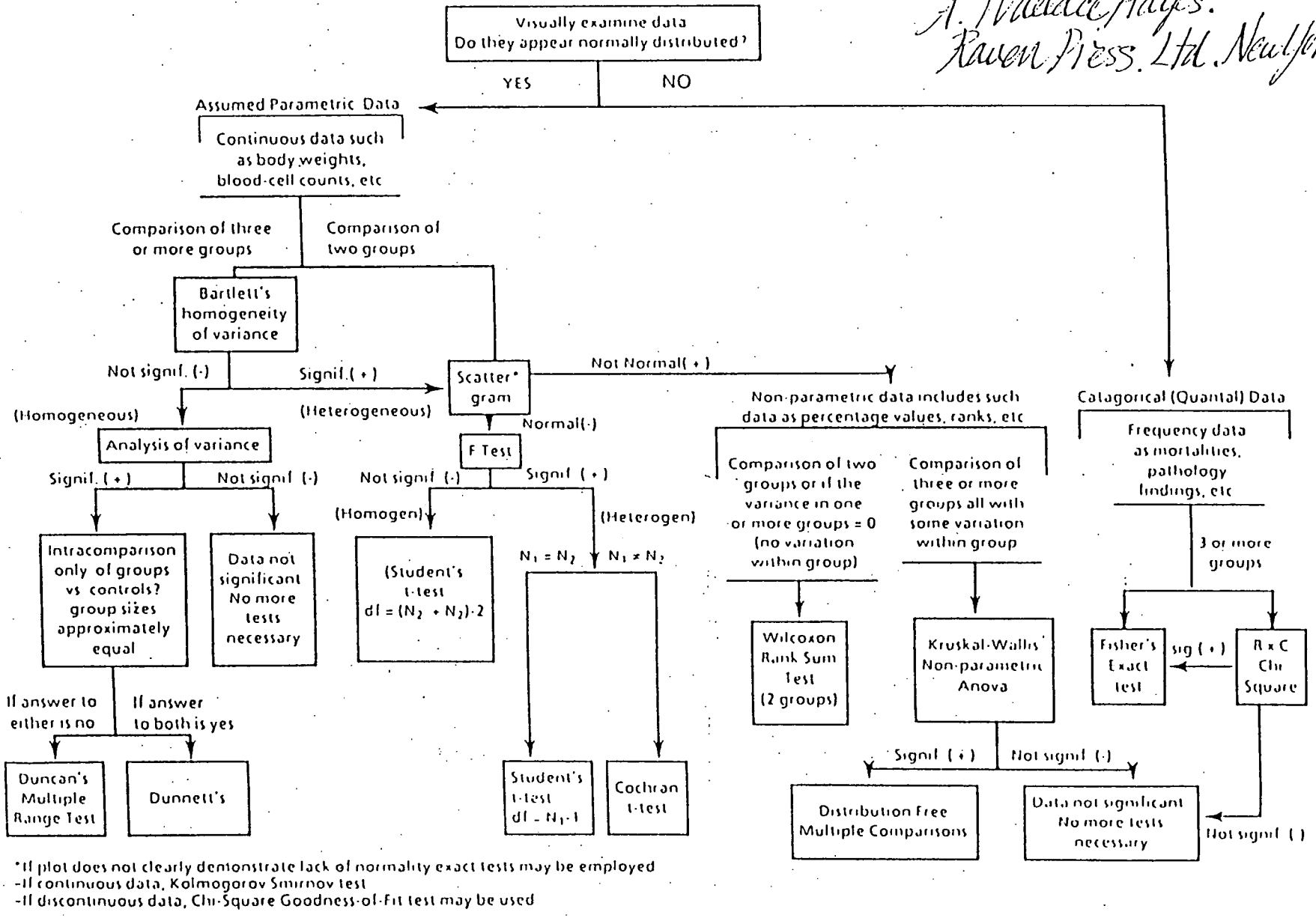

FIG. 2. Decision tree for selecting hypothesis-testing procedure. (•) If plot does not clearly demonstrate lack of normality, exact tests may be employed. (+) If continuous data, Kolmongorox–Smirnov test may be used. (–) If discontinuous data, chi-square goodness-of-fit test may be used.